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<223> Description of Artificial Sequence: Plasmid

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<221> gene

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<212> DNA
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<223> Description of Artificial Sequence: pGM716 with deletion of HpaI fragment
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<220>

<223> Description of Artificial Sequence: udp and deoD cloned in pUC18 so to create a fusion between the two proteins

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<211> 6299
<212> DNA
<213> Artificial Sequence
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<220>

<223> Description of Artificial Sequence: udp and deoD cloned in pUC18 so to create a fusion between the two proteins bonded to each other via an aa linker

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<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: cloning vector derived from pUC18

<400> 11

gegeecaata egeaaacege eteteceege gegttggeeg atteattaat geagaatteg 60 ageteggtae eeggggatee tetagagteg acetgeagge atgeaagett atggtgeact 120 ctcagtacaa tctgctctga tgccgcatag ttaagccagc cccgacaccc gccaacaccc 180 gctgacgcgc cctgacgggc ttgtctgctc ccggcatccg cttacagaca agctgtgacc 240 gtctccggga gctgcatgtg tcagaggttt tcaccgtcat caccgaaacg cgcgagacga 300 aagggcctcg tgatacgcct atttttatag gttaatgtca tgataataat ggtttcttag 360 acqtcaqqtq qcacttttcq qqqaaatqtq cqcqqaaccc ctatttqttt atttttctaa 420 atacattcaa atatgtatcc gctcatgaga caataaccct gataaatgct tcaataatat 480 tgaaaaagga agagtatgag tattcaacat ttccgtgtcg cccttattcc cttttttgcg 540 gcattttgcc ttcctgtttt tgctcaccca gaaacgctgg tgaaagtaaa agatgctgaa 600 gatcagttgg gtgcacgagt gggttacatc gaactggatc tcaacagcgg taagatcctt 660 gagagttttc gccccgaaga acgttttcca atgatgagca cttttaaagt tctgctatgt 720 ggcgcggtat tatcccgtat tgacgccggg caagagcaac tcggtcgccg catacactat 780 totoagaatg acttggttga gtactcacca gtoacagaaa agcatottac ggatggcatg 840 acagtaagag aattatgcag tgctgccata accatgagtg ataacactgc ggccaactta 900 cttctgacaa cgatcggagg accgaaggag ctaaccgctt ttttgcacaa catgggggat 960 catgtaactc geettgateg ttgggaaceg gagetgaatg aageeatace aaaegaegag 1020 cytyacacca cyatycctyt aycaatyyca acaacyttyc ycaaactatt aactyycyaa 1080 ctacttactc tagcttcccg gcaacaatta atagactgga tggaggcgga taaagttgca 1140 ggaccactte tgegetegge cetteegget ggetggttta ttgetgataa atetggagee 1200 ggtgagcgtg ggtctcgcgg tatcattgca gcactggggc cagatggtaa gccctcccgt 1260 atogtagtta totacacgac ggggagtcag gcaactatgg atgaacgaaa tagacagatc 1320 gctgagatag gtgcctcact gattaagcat tggtaactgt cagaccaagt ttactcatat 1380 atactttaga ttgatttaaa acttcatttt taatttaaaa ggatctaggt gaagatcctt 1440 tttgataatc tcatgaccaa aatcccttaa cgtgagtttt cgttccactg agcgtcagac 1500 cccgtagaaa agatcaaagg atcttcttga gatccttttt ttctgcgcgt aatctgctgc 1560 ttgcaaacaa aaaaaccacc gctaccagcg gtggtttgtt tgccggatca agagctacca 1620 actettttte egaaggtaae tggetteage agagegeaga taccaaatae tgteetteta 1680

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gtgtagcegt agttaggeca ceaetteaag aactetgtag cacegectae ataceteget 1740 etgetaatee tgttaceagt ggetgetgee agtggegata agtegtget tacegggttg 1800 gacteaagae gatagttace ggataaggeg cageggtegg getgaacggg gggttegtge 1860 acacagecea gettggageg aacgacetae acegaactga gatacetaea gegtgageta 1920 tgagaaaggeg ceaegettee egaagggaga aaggeggaca ggtateeggt aageggeagg 1980 gteggaacag gagagegae gagggaget eeagggggaa acgeetggta tetttatagt 2040 eetgtegggt teegecaeet etgacettgag egetgatet tgtgatgete gteagggggg 2100 eggageetat ggaaaaacge eageaaegeg geettttae ggtteetgge ettttgetgg 2160 eettttgete acatgttett teetgegtta teeeetgatt etgtggataa eegtattaee geetttgag egettttgag eggagaaeg eggagaga eggagaga eggagaga eggaaga eggaaga eggaaga
```

<210> 12

<211> 3031

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: udp and deoD cloned into pGM746 without upstream ptac promoter

<400> 12 qcqcccaata cqcaaaccqc ctctccccqc qcqttqqccq attcattaat qcaqaattcq 60 agctcggtac ccggggatcc tagcaggagg gaattcttcc atggctaccc cacacattaa 120 tgcagaaatg ggcgatttcg ctgacgtagt tttgatgcca ggcgacccgc tgcgtgcgaa 180 gtatattgct gaaactttcc ttgaagatgc ccgtgaagtg aacaacgttc gcggtatgct 240 gggcttcacc ggtacttaca aaggccgcaa aatttccgta atgggtcacg gtatgggtat 300 cccgtcctgc tccatctaca ccaaagaact gatcaccgat ttcggcgtga agaaaattat 360 ccgcgtgggt tcctgtggcg cagttctgcc gcacgtaaaa ctgcgcgacg tcgttatcgg 420 tatgggtgcc tgcaccgatt ccaaagttaa ccgcatccgt tttaaagacc atgactttgc 480 cgctatcgct gacttcgaca tggtgcgtaa cgcagtagat gcagctaaag cactgggtat 540 tgatgctcgc gtgggtaacc tgttctccgc tgacctgttc tactctccgg acggcgaaat 600 gttcgacgtg atggaaaaat acggcattct cggcgtggaa atggaagcgg ctggtatcta 660 cggcgtcgct gcagaatttg gcgcgaaagc cctgaccatc tgcaccgtat ctgaccacat 720 ccgcactcac gagcagacca ctgccgctga gcgtcagact accttcaacg acatgatcaa 780 aatogcactg gaatocgtto tgotgggoga taaagagtaa gtogacotgo aggcatgcaa 840 gettatggtg cacteteagt acaatetget etgatgeege atagttaage cageecegae 900 accegecaac accegetgac gegecetgac gggettgtet geteceggea teegettaca 960 gacaagetgt gacegtetee gggagetgea tgtgteagag gtttteaceg teateacega 1020 aacgegegag acgaaaggge ctegtgatac geetattttt ataggttaat gteatgataa 1080 taatggtttc ttagacgtca ggtggcactt ttcggggaaa tgtgcgcgga accectattt 1140 gtttattttt ctaaatacat tcaaatatgt atccgctcat gagacaataa ccctgataaa 1200 tgcttcaata atattgaaaa aggaagagta tgagtattca acatttccgt gtcgccctta 1260 ttcccttttt tgcggcattt tgccttcctg tttttgctca cccagaaacg ctggtgaaag 1320 taaaagatgc tgaagatcag ttgggtgcac gagtgggtta catcgaactg gatctcaaca 1380 geggtaagat cettgagagt tttegeeceg aagaacgttt tecaatgatg ageactttta 1440 aagttotgot atgtggogog gtattatooc gtattgacgo ogggoaagag caactoggto 1500 ÷ .

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geogeataca etatteteag aatgaettgg ttgagtaete accagteaca gaaaageate 1560
ttacggatgg catgacagta agagaattat gcagtgctgc cataaccatg agtgataaca 1620
ctgcggccaa cttacttctg acaacgatcg gaggaccgaa ggagctaacc gcttttttgc 1680
acaacatggg ggatcatgta actcgccttg atcgttggga accggagctg aatgaagcca 1740
taccaaacga cgagcgtgac accacgatgc ctgtagcaat ggcaacaacg ttgcgcaaac 1800
tattaactgg cgaactactt actctagctt cccggcaaca attaatagac tggatggagg 1860
eggataaagt tgeaggacea ettetgeget eggecettee ggetggetgg tttattgetg 1920
ataaatctqq aqccqqtqaq cqtqqqtctc qcqqtatcat tqcaqcactq qqqccaqatq 1980
gtaagccctc ccgtatcgta gttatctaca cgacggggag tcaggcaact atggatgaac 2040
gaaatagaca gatcgctgag ataggtgcct cactgattaa gcattggtaa ctgtcagacc 2100
aagtttactc atatatactt tagattgatt taaaacttca tttttaattt aaaaggatct 2160
aggtgaagat cctttttgat aatctcatga ccaaaatccc ttaacgtgag ttttcgttcc 2220
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gcgtaatctg ctgcttgcaa acaaaaaaac caccgctacc agcggtggtt tgtttgccgg 2340
atcaagagct accaactctt tttccgaagg taactggctt cagcagagcg cagataccaa 2400
atactgtect tetagtgtag cegtagttag gecaecactt caagaactet gtageacege 2460
ctacatacct cgctctgcta atcctgttac cagtggctgc tgccagtggc gataagtcgt 2520
qtcttaccqq qttqqactca aqacqataqt taccqqataa ggcgcagcgg tcgggctgaa 2580
cggggggttc gtgcacacag cccagcttgg agcgaacgac ctacaccgaa ctgagatacc 2640
tacagcgtga gctatgagaa agcgccacgc ttcccgaagg gagaaaggcg gacaggtatc 2700
cggtaagcgg cagggtcgga acaggagagc gcacgaggga gcttccaggg ggaaacgcct 2760
ggtatettta tagteetgte gggtttegee acctetgaet tgagegtega tttttgtgat 2820
gctcgtcagg ggggcggagc ctatggaaaa acgccagcaa cgcggccttt ttacggttcc 2880
tggccttttg ctggcctttt gctcacatgt tctttcctgc gttatcccct gattctgtgg 2940
ataaccgtat taccgccttt gagtgagetg ataccgctcg ccgcagccga acgaccgage 3000
                                                                  3031
gcagcgagtc agtgagcgag gaagcggaag a
```

```
<210> 13
<211> 3128
<212> DNA
<213> Artificial Sequence
```

<220>

<223> Description of Artificial Sequence: deoD cloned
 downstream ptac promoter

```
<400> 13
gegeccaata egeaaacege eteteceege gegttggeeg atteattaat geagaatteg 60
ageteegaca teataaeggt tetggeaaat attetgaaat gagetgttga caattaatea 120
teggetegta taatgtgtgg aattgtgage ggataacaat teacacagg aggateetag 180
caggagggaa teetecatg getaceecae acattaatge agaaatggge gatteegetg 240
aegtagttt gatgeeagge gaceegetge gtgegaagta tattgetgaa aettteettg 300
aagatgeeeg tgaagtgaae aaegttegeg gtatgetggg etteaeeggt aettacaaag 360
geegeaaaat teegtaatg ggteaeggta tgggtateee gteetgee atetacaea 420
aagaactgat caeegatte ggegtgaaga aaattateeg egtggttee tgtggegeag 480
teetgeegea egtaaaactg egegaegteg ttateggtat gggtgeetge aeegatteea 540
aagttaaeeg cateegttt aaagaeeatg aetttgeege tategetgae ttegaeatgg 600
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tgcgtaacgc	agtagatgca	gctaaagcac	tgggtattga	tgctcgcgtg	ggtaacctgt	660
tctccgctga	cctgttctac	tctccggacg	gcgaaatgtt	cgacgtgatg	gaaaaatacg	720
gcattctcgg	cgtggaaatg	gaagcggctg	gtatctacgg	cgtcgctgca	gaatttggcg	780
cgaaagccct	gaccatctgc	accgtatctg	accacatccg	cactcacgag	cagaccactg	840
ccgctgagcg	tcagactacc	ttcaacgaca	tgatcaaaat	cgcactggaa	tccgttctgc	900
tgggcgataa	agagtaagtc	gacctgcagg	catgcaagct	tatggtgcac	tctcagtaca	960
atctgctctg	atgccgcata	gttaagccag	ccccgacacc	cgccaacacc	cgctgacgcg	1020
ccctgacggg	cttgtctgct	cccggcatcc	gcttacagac	aagctgtgac	cgtctccggg	1080
agctgcatgt	gtcagaggtt	ttcaccgtca	tcaccgaaac	gcgcgagacg	aaagggcctc	1140
gtgatacgcc	tatttttata	ggttaatgtc	atgataataa	tggtttctta	gacgtcaggt	1200
ggcacttttc	ggggaaatgt	gcgcggaacc	cctatttgtt	tatttttcta	aatacattca	1260
aatatgtatc	cgctcatgag	acaataaccc	tgataaatgc	ttcaataata	ttgaaaaagg	1320
aagagtatga	gtattcaaca	tttccgtgtc	gcccttattc	ccttttttgc	ggcattttgc	1380
cttcctgttt	ttgctcaccc	agaaacgctg	gtgaaagtaa	aagatgctga	agatcagttg	1440
ggtgcacgag	tgggttacat	cgaactggat	ctcaacagcg	gtaagatcct	tgagagtttt	1500
cgccccgaag	aacgttttcc	aatgatgagc	acttttaaag	ttctgctatg	tggcgcggta	1560
ttatcccgta	ttgacgccgg	gcaagagcaa	ctcggtcgcc	gcatacacta	ttctcagaat	1620
gacttggttg	agtactcacc	agtcacagaa	aagcatctta	cggatggcat	gacagtaaga	1680
gaattatgca	gtgctgccat	aaccatgagt	gataacactg	cggccaactt	acttctgaca	1740
acgatcggag	gaccgaagga	gctaaccgct	tttttgcaca	acatggggga	tcatgtaact	1800
cgccttgatc	gttgggaacc	ggagctgaat	gaagccatac	caaacgacga	gcgtgacacc	1860
acgatgcctg	tagcaatggc	aacaacgttg	cgcaaactat	taactggcga	actacttact	1920
ctagcttccc	ggcaacaatt	aatagactgg	atggaggcgg	ataaagttgc	aggaccactt	1980
			attgctgata			
			ccagatggta			
			gatgaacgaa			
			tcagaccaag			
			aggatctagg			
			tegttecact			
			tttctgcgcg			
			ttgccggatc			
			ataccaaata			
			gcaccgccta			
			aagtcgtgtc			
			ggctgaacgg			
			agatacctac			
			aggtatccgg			
			aacgcctggt			
			ttgtgatgct			
			cggttcctgg			
			tctgtggata			
	ccgctcgccg	cagccgaacg	accgagcgca	gcgagtcagt	gagcgaggaa	
gcggaaga						3128

<210> 14 <211> 3934 <212> DNA <220>

<223> Description of Artificial Sequence: udp and deoD cloned downstream ptac promoter

<400> 14 gcgcccaata cgcaaaccgc ctctccccgc gcgttggccg attcattaat gcagaattcg 60 agetecgaea teataaeggt tetggeaaat attetgaaat gagetgttga eaattaatea 120 teggetegta taatgtgtgg aattgtgage ggataacaat tteacacagg aggatectag 180 caqqaqqqaa ttcttccatq qctaccccac acattaatqc agaaatqqqc gatttcqctq 240 acqtaqtttt gatgccaggc gacccgctgc gtgcgaagta tattgctgaa actttccttg 300 aaqatqcccq tqaaqtgaac aacgttcgcg gtatgctggg cttcaccggt acttacaaag 360 geogeaaaat tteegtaatg ggteaeggta tgggtateee gteetgetee atetacaeea 420 aagaactgat caccgattte ggegtgaaga aaattateeg egtgggttee tgtggegeag 480 ttctgccgca cgtaaaactg cgcgacgtcg ttatcggtat gggtgcctgc accgattcca 540 aagttaaccg catccgtttt aaagaccatg actttgccgc tatcgctgac ttcgacatgg 600 tgcgtaacgc agtagatgca gctaaagcac tgggtattga tgctcgcgtg ggtaacctgt 660 tctccgctga cctgttctac tctccggacg gcgaaatgtt cgacgtgatg gaaaaatacg 720 gcattctcgg cgtggaaatg gaagcggctg gtatctacgg cgtcgctgca gaatttggcg 780 cgaaagccct gaccatctgc accgtatctg accacatccg cactcacgag cagaccactg 840 ccgctgagcg tcagactacc ttcaacgaca tgatcaaaat cgcactggaa tccgttctgc 900 tgggcgataa agagtaagtc gacacaggaa acagctatga ccatgattac gaattcgagc 960 teggtaceat ceatgteeaa gtetgatgtt ttteateteg geeteaetaa aaacgattta 1020 caaggggeta cgcttgccat cgtccctggc gacccggatc gtgtggaaaa gatcgccgcg 1080 ctgatggata agccggttaa gctggcatct caccgcgaat tcactacctg gcgtgcagag 1140 ctggatggta aacctgttat cgtctgctct accggtatcg gcggcccgtc tacctctatt 1200 gctgttgaag agctggcaca gctgggcatt cgcaccttcc tgcgtatcgg tacaacgggc 1260 gctattcagc cgcatattaa tgtgggtgat gtcctggtta ccacggcgtc tgtccgtctg 1320 gatggcgcga gcctgcactt cgcaccgctg gaattcccgg ctgtcgctga tttcgaatgt 1380 acgactgcgc tggttgaagc tgcgaaatcc attggcgcga caactcacgt tggcgtgaca 1440 gettettetg atacetteta eccaggteag gaacgttacg atacttacte tggtegegta 1500 gttcgtcact ttaaaggttc tatggaagag tggcaggcga tgggcgtaat gaactatgaa 1560 atggaatctg caaccetget gaccatgtgt gcaagtcagg geetgegtge eggtatggta 1620 gegggtgtta tegttaaceg caeccagcaa gagateeega atgetgagae gatgaaacaa 1680 accgaaagcc atgcggtgaa aatcgtggtg gaagcggcgc gtcgtctgct gtaattctct 1740 taagettatg gtgcactete agtacaatet getetgatge egeatagtta ageeageeee 1800 gacaccegee aacacceget gacgegeet gacgggettg tetgeteeeg geateegett 1860 acagacaage tgtgaccgte teegggaget geatgtgtea gaggttttea eegteateae 1920 cgaaacgcgc gagacgaaag ggcctcgtga tacgcctatt tttataggtt aatgtcatga 1980 taataatggt ttcttagacg tcaggtggca cttttcgggg aaatgtgcgc ggaaccccta 2040 tttgtttatt tttctaaata cattcaaata tgtatccgct catgagacaa taaccctgat 2100 aaatgcttca ataatattga aaaaggaaga gtatgagtat tcaacatttc cgtgtcgccc 2160 ttattccctt ttttgcggca ttttgccttc ctgtttttgc tcacccagaa acgctggtga 2220 aagtaaaaga tgctgaagat cagttgggtg cacgagtggg ttacatcgaa ctggatctca 2280 acageggtaa gateettgag agttttegee eegaagaaeg tttteeaatg atgageaett 2340 ttaaagttet getatgtgge geggtattat eeegtattga egeegggeaa gageaacteg 2400 gtcgccgcat acactattct cagaatgact tggttgagta ctcaccagtc acagaaaagc 2460

```
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acactgcggc caacttactt ctgacaacga tcggaggacc gaaggagcta accgcttttt 2580
tgcacaacat gggggatcat gtaactcgcc ttgatcgttg ggaaccggag ctgaatgaag 2640
ccataccaaa cgacgagcgt gacaccacga tgcctgtagc aatggcaaca acgttgcgca 2700
aactattaac tggcgaacta cttactctag cttcccggca acaattaata gactggatgg 2760
aggoggataa agttgcagga ccacttctgc gctcggccct tccggctggc tggtttattg 2820
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accaagttta ctcatatata ctttagattg atttaaaact tcatttttaa tttaaaagga 3060
tctaggtgaa gatccttttt gataatctca tgaccaaaat cccttaacgt gagttttcgt 3120
tecactgage gtcagaccce gtagaaaaga tcaaaggate ttettgagat cettttttte 3180
tgegegtaat etgetgettg caaacaaaaa aaccaceget accageggtg gtttgtttgc 3240
cggatcaaga gctaccaact cttttccga aggtaactgg cttcagcaga gcgcagatac 3300
caaataotgt cettetagtg tageegtagt taggeeacca etteaagaae tetgtageae 3360
cgcctacata cctcgctctg ctaatcctgt taccagtggc tgctgccagt ggcgataagt 3420
cgtgtcttac cgggttggac tcaagacgat agttaccgga taaggcgcag cggtcgggct 3480
gaacgggggg ttcgtgcaca cagcccagct tggagcgaac gacctacacc gaactgagat 3540
acctacagcg tgagctatga gaaagcgcca cgcttcccga agggagaaag gcggacaggt 3600
atceggtaag eggeagggte ggaacaggag agegeacgag ggagetteea gggggaaaeg 3660
cctggtatct ttatagtcct gtcgggtttc gccacctctg acttgagcgt cgatttttgt 3720
gatgctcgtc aggggggggg agcctatgga aaaacgccag caacgcggcc tttttacggt 3780
tectggeett ttgetggeet tttgeteaca tgttetttee tgegttatee eetgattetg 3840
tggataaccg tattaccgcc tttgagtgag ctgataccgc tcgccgcagc cgaacgaccg 3900
                                                                   3934
agcgcagcga gtcagtgagc gaggaagcgg aaga
```

```
<210> 15
<211> 6046
<212> DNA
<213> Artificial Sequence
```

<220>

<223> Description of Artificial Sequence: udp and deoD
 cloned downstream ptac promoter

```
<400> 15
gcgcccaata cgcaaaccgc ctctccccgc gcgttggccg attcattaat gcagaattcg 60
agctccgaca tcataacggt tctggcaaat attctgaaat gagctgttga caattaatca 120
tcggctcgta taatgtgtgg aattgtgagc ggataacaat ttcacacagg aggatcctag 180
caggagggaa ttcttccatg gctaccccac acattaatgc agaaatgggc gatttcgctg 240
acgtagtttt gatgccaggc gacccgctgc gtgcgaagta tattgctgaa actttccttg 300
aagatgcccg tgaagtgaac aacgttcgcg gtatgctggg cttcaccggt acttacaaag 360
gccgcaaaat ttccgtaatg ggtcacggta tgggtatccc gtcctgctcc atctacaca 420
aagaactgat caccgatttc ggcgtgaaga aaattatccg cgtggttcc tgtggcgcag 480
ttctgccgca cgtaaaactg cgcgacgtcg ttatcggtat gggtgcctgc accgattcca 540
aagttaaccg catccgttt aaagaccatg actttgccgc tatcgctgt ggtaacctgt 660
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